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(A2) $\hat{L}^n = \theta_L^n(\sigma_{LL}^n - \sigma_{LK}^n)\hat{w}^n + \theta_K^n(\sigma_{LK}^n - \sigma_{KK}^n)\,\hat{r}^n + \theta_I^n(\sigma_{LI}^n - \sigma_{KI}^n)\hat{g}^n$.

Substituting for $\hat{w}^n$ from (3) and utilizing the adding-up restrictions, $-\sigma_{LL}\theta_L = \sigma_{LK}\theta_K + \sigma_{LI}\theta_I$ and $-\sigma_{KK}\theta_K = \sigma_{LK}\theta_L + \sigma_{KI}\theta_I$, (A2) becomes

(A3) $$\hat{L}^n = -\alpha\gamma_n[\sigma_{LK}^n(1 - \theta_I^n) + \sigma_{LI}^n\theta_I^n]\hat{P}_n + [\sigma_{LK}^n(1 - \theta_I^n) + \sigma_{KI}^n\theta_I^n]\hat{r}^n + \theta_I^n(\sigma_{LI}^n - \sigma_{KI}^n)\hat{g}^n .$$

In the case where the production function is separable between primary factors and imported inputs, $\sigma_{LI} = \sigma_{KI} = \sigma_{VI}$ and (A3) simplifies to

(A4) $$\hat{L}^n = [\sigma_{LK}^n(1 - \theta_I^n) + \sigma_{VI}^n\theta_I^n](\hat{r}^n - \alpha\gamma_n\hat{P}_n).$$

From equations (2) and (3):

$$\hat{r}^n = [(1 - \alpha\gamma_n\theta_L^n)\hat{P}_n - \theta_I^n\hat{g}^n]/\theta_K^n .$$

Substituting this expression into (A4) gives equation (13) in the text

(A5) $$\hat{L}^n = a_1\hat{P}_n - a_2\hat{g}^n ,$$

where

$$a_1 \equiv [1 - \alpha\gamma_n(1 - \theta_I^n)][\sigma_{LK}^n(1 - \theta_I^n) + \sigma_{VI}^n\theta_I^n]/\theta_K^n$$
$$a_2 \equiv \theta_I^n[\sigma_{LK}^n(1 - \theta_I^n) + \sigma_{VI}^n\theta_I^n]/\theta_K^n .$$

The expression for I^n stated in (14) is obtained by the same procedure.

7 Fiscal and Monetary Policy, Financial Intermediation, Inflation, and Growth

In previous chapters I have often emphasized the self-reinforcing and stagflationary nature of the various macroeconomic mechanisms linking large fiscal deficits, high inflation, financial disintermediation, and slow growth. At present, Mexico, like so many other Latin American countries, seems to be trapped in a self-perpetuating spiral of this sort: high inflation provokes a flight of funds from the banking system; the low level of financial intermediation curtails the supply of bank loans for productive investment and exacerbates short-run inflationary pressures by reducing the demand for the monetary base; as low investment rates translate into slower growth in productive capacity, a new wave of financial intermediation takes place, tax revenue declines, the fiscal deficit increases, and the cycle begins anew but at a higher rate of inflation than before. The Mexican government has attempted to break out of this destabilizing spiral by cutting fiscal spending, by setting high marginal reserve ratios (nearly 100 percent) to increase the demand for the monetary base, and by financing a greater proportion of the fiscal deficit through bond sales. This approach has clearly not worked well, and a large number of unresolved policy issues remain. Is it better to reduce the deficit by raising taxes or cutting expenditures? Will higher reserve ratios and regulations requiring banks to purchase more government bonds reduce the inflation rate and lower bond rates or, perversely, will they lead to greater financial disintermediation, capital decumulation, and higher inflation and larger fiscal deficits as the tax base shrinks? Similarly, will reduced monetization of the deficit lower the inflation rate, as claimed by simple monetarist models; or, instead, will the inflation rate increase either because interest payments on the government debt increase sharply or because higher bond rates strongly crowd out private investment, lowering future output and tax revenues?

The aim of this chapter is to gain a deeper understanding of these policy issues by developing a model that captures various key elements making up the fiscal deficit–financial intermediation–growth–inflation nexus. In section 7.1 I develop the basic model, while in sections 7.2–7.7 I analyze the consequences of different policy packages designed to service the external debt. The results are used in the final section to evaluate the stabilization program followed by the De La Madrid administration.

7.1 The Model

The standard analysis of inflation and fiscal deficits follows the early work of Cagan (1956) and Mundell (1965) and is based on a minimal model in which real output is exogenous and high-powered money is the sole financial asset in the economy. This framework might be adequate for analysis of hyperinflation, but it is too simple to yield any insight about the difficulties facing the Mexican economy, an economy that is stumbling deeper into stagflation but has not yet reached the dysfunctional point of hyperinflation.

In what follows, a fairly rich model is developed that allows for inside and outside money, interest-bearing government debt, and endogenous capital accumulation. Due to the detailed specification of the financial sector, the dynamics for wealth accumulation are analytically intractable. The analysis, therefore, will be confined to a comparison of steady-state outcomes. This is an acknowledged shortcoming. Comparative steady-state analysis, however, is one important element in judging the adequacy of different policy packages in that it defines the long-run economic tradeoffs that will ultimately have to be confronted. Such comparisons enable one to judge whether a stabilization program is inherently sound or instead a "quick fix" that will eventually create more severe macroeconomic problems. The central thesis of this chapter is that many of the recent Mexican stabilization measures have been of the quick-fix variety.

The model is laid out in stages, beginning with the goods and labor markets.

7.1.1 Aggregate Supply and the Labor Market

The economy is small and completely open, producing one importable manufactured good and two agricultural export goods. There are no trade taxes and the world market price of each good is fixed at unity. Consequently, all domestic prices are set by the exchange rate and all relative prices also equal unity (choose any good as the numeraire). Capital and labor are used in production of the manufactured good, and land and labor in production of the agricultural goods. Technology exhibits constant returns to scale in each sector, and the aggregate supplies of land and labor are perfectly inelastic. Land is intersectorally mobile.

As in the model of the preceding chapter, the labor market is dualistic. A rigid real wage, w^m, prevails in the manufacturing sector while a lower, market-clearing real wage, w^x, is paid in the two agricultural sectors. Besides the private manufacturing sector, the public sector pays a relatively high wage. Parastatal firms employ N^g workers at a fixed real wage, $w^g > w^x$. Both N^g and w^g are treated as government policy variables. The public sector capital stock is fixed, so parastatal output, Q^g, varies only with N^g:

$$(1) \qquad Q^g = F(L^g), \quad F' > 0.$$

This specification for the real side of the economy implies that all real factor prices are constant as long as relative goods prices are constant.[1] Since real factor prices are fixed, employment in the high-wage manufacturing sector, N^m, varies proportionately with the capital stock, K:

$$(2) \qquad dN^m = \ell dK,$$

where $\ell \equiv N^m/K$, the (constant) labor-capital ratio.[2]

Using standard methods from duality theory, it is easy to verify that the value of private sector income, Y^p, and total wage income, Y^w, may be represented by functions of the form

$$(3) \qquad Y^p = Y^p(K, N^g, w^g)$$

$$(4) \qquad Y^w = Y^w(K, N^g, w^g),$$

where

$$Y_1^p = r_K + (w^m - w^x)\ell, \quad Y_1^w = (w^m - w^x)\ell,$$
$$Y_2^p = Y_2^w = w^g - w^x,$$
$$Y_3^p = Y_3^w = N^g,$$

and r_K is the competitive capital rental. When the capital stock rises, output increases directly by the amount r_K and indirectly by $(w^m - w^x)\ \ell$ as labor is reallocated from the low-wage agricultural sectors to the high-wage manufacturing sector. Similarly, an increase in public sector employment raises private income by the extent of the sectoral wage gap, $w^g - w^x$.

The main reason for postulating this particular productive structure is that it permits a simple and clear delineation of a key general equilibrium relation, namely, the interdependence of capital accumulation and financial intermediation. An increase in the capital stock raises total wage income by expanding employment in the high-wage manufacturing sector. In general equilibrium, this triggers a mutually reinforcing, virtuous cycle of capital accumulation and financial deepening: as workers increase their holdings of demand deposits, banks extend more loans, which leads to further capital accumulation, further growth in wage income and bank lending, etc. The same feedback mechanism operates and broadly similar qualitative results emerge in any model in which capital accumulation increases labor income (for example, in models with integrated labor markets where a rise in K bids up the market-clearing wage).

7.1.2 The Banking System

The government owns and regulates all banks. Bank interest rates are administratively determined and are set below their market-clearing levels. From the funds supplied by the public at the regulated deposit rate, banks either purchase government bonds or make loans to private sector firms. As the real loan rate is too low to clear the market, loan demand is rationed.[3] Furthermore, in keeping with regulations that require banks to apportion a sizable fraction of their investible funds to the purchase of various government financial assets, the division of the bank portfolio between capital and bonds is treated as exogenous. Banks face a reserve requirement, k, and must channel the fraction k_b of their deposits, D, into bond purchases. Captive bank bond demand, B^b, is thus

$$B^b = k_b D \tag{5}$$

and (assuming excess reserves are zero) the quantity of loans, L, is determined residually as

$$L = xD. \tag{6}$$

where $x \equiv 1 - k - k_b$.

Though the "commercial" banks in Mexico are managed by and classified as part of the private sector, clearly their losses (or, improbably, their profits) must be absorbed by the public sector budget. It is useful at this juncture, therefore, to note from (5) and (6) that real bank profits, Z, are given by

$$Z = [r_L x + r_b k_b - r_d - \pi k]D, \tag{7}$$

where π represents the inflation rate and r_L, r_b, and r_d denote, respectively, the real loan rate, the real bond rate, and the real deposit rate.

7.1.3 Capital Accumulation and Private Sector Asset Demands

Any model of the financial sector in Mexico should faithfully reflect certain important stylized facts concerning asymmetries in the pattern of asset holdings across agents. First, whereas cash (or currency) accounts for a negligible fraction of total wealth of high-income groups, the poor hold virtually all of their wealth in the form of money broadly defined (currency + demand deposits).[4] Second, even among those who are relatively well off, few have the opportunity to invest in capital assets due to the absence of an extensive and well-functioning equities market.

With these stylized facts in mind, I assume the specialized pattern of asset holdings described in table 7.1.[5] This particular configuration of asset holdings can be plausibly explained by a mixture of institutional constraints and different patterns of asset dominance. Capital dominates bonds, but neither landowners nor workers can acquire capital as they are not directly involved in organization of the productive process in the manufacturing sector. In addition, workers do not hold bonds because either their time preference rate is too high or large fixed transactions costs render small bond purchases unprofitable. Bonds are an important saving instrument only for the landowners, who may be thought of in the current model as proxying for the upper middle class. And finally, while both currency and demand deposits serve as mediums of exchange and hence enter agents' utility functions, the transactions needs of family firms and landowners are such that, for these two agents, demand deposits dominate currency. The main consequence of this latter assumption is that when the government pegs the

Table 7.1 The Pattern of Asset Holdings

Agent	Assets	Liabilities
Family firms	capital, demand deposits	bank loans
Landowners	bonds, demand deposits	none
Workers	demand deposits, currency	none

real deposit and real loan rates, workers alone shoulder the burden of the inflation tax.

Private sector asset demands are obtained by solving a set of explicitly specified intertemporal optimization problems. Each agent is infinitely lived and has a recursive utility functional of the type formulated by Uzawa (1968). This class of utility functionals has the desirable property of allowing local time preference to vary continuously as a function of current utility (Epstein and Hynes 1983; Epstein 1987). In steady-state equilibrium, utility remains at the level u^* and the time preference rate becomes the constant $\rho(u^*)$. Following the usual practice in the literature, I assume

$$\text{(8)} \qquad \text{(i) } \rho' > 0 \text{ and (ii) } \rho - \rho' u > 0.$$

The first condition reflects the notion of increasing marginal impatience, to use the terminology of Lucas and Stokey (1984). The second implies that in a comparison of two stationary consumption streams, the stream having higher instantaneous utility confers higher total utility and will be preferred.

Succeeding sections are devoted to characterizing the nature of each agent's asset demands. The discussion in the text is largely informal. Derivations of the asset demands may be found in the appendix to this chapter. Notational conventions are as follows: all variables are expressed in real terms, and c, v, and w superscripts refer, respectively, to capitalist family firms, landowners, and workers; common, unsuperscripted symbols are used for the utility function and the time preference rate, but it is understood that these differ across agents.

Family Firms

The family firm holds its (gross) wealth in the form of two assets, physical capital and demand deposits. Deposits, unlike bonds, are not dominated by capital because they yield nonpecuniary services in facilitating transactions. These nonpecuniary services are indirectly accounted for by incorporating real deposits into the utility function. Current utility, u, is represented by the indirect utility function

$$u = V(E^c, D^c),$$

where

$$V_E, V_D > 0, \quad V_{DE} = V_{ED} > 0, \quad V_{EE}, V_{DD} < 0$$

and E^c is real consumption expenditure and D^c is real demand deposits. Increases in E^c and D^c raise utility but at a diminishing rate.[6] V has positive cross partial derivatives, indicating that a higher level of real consumption raises the marginal utility of deposits.

Investment in physical capital and accumulation of real deposits are financed out of retained profits and bank loans, L. Since the firm is rationed in in its access to bank loans, retained profits are the marginal source of investment funds and time preference affects steady-state asset demands. In a stationary equilibrium where K, E^c, D^c, and L are all constant,

$$\phi_K(1 - \tau) = \rho\{V[\phi(K)(1 - \tau) + r_d D^c - r_L L, D^c]\} \tag{9}$$

$$\frac{V_D[\phi(K)(1 - \tau) + r_d D^c - r_L L, D^c]}{V_E[\phi(K)(1 - \tau) + r_d D^c - r_L L, D^c]} = \phi_K(1 - \tau) - r_d. \tag{10}$$

$\phi(K)$ is the restricted profit function with the constant w^m suppressed. ϕ_K, the return on capital, equals the competitive capital rental, r_K. τ is a flat ad valorem tax that applies to all noninterest income (gross profits, wages, and land rents). In the present model, τ is equivalent to a value-added tax.

Equations (9) and (10) state that capital will be accumulated until its return equals the time preference rate and that the marginal rate of substitution between consumption and deposits will be equated to the opportunity cost of deposits, $\phi_K(1 - \tau) - r_d$. Solving these two equations for K and D^c gives

$$K = f^1(L, r_d, r_L, \tau) \tag{11}$$

$$D^c = h^c(\tau), \tag{12}$$

where

$$f_1^1, f_3^1 > 0; \quad f_2^1 < 0; \quad f_4^1, h_1^c \gtrless 0; \quad f_2^1 + f_3^1 > 0.$$

Under constant returns to scale, the return on capital is constant for a given value of w^m. As the return on capital does not vary across steady states, the optimal long-run response to increases in L, r_d, or r_L is to keep real deposit holdings unchanged and to adjust K until real income (inclusive of net interest payments) returns to its original level, at which $\rho = \phi_K(1 - \tau)$. The expressions for f_1^1, f_2^1 and f_3^1 are thus quite simple:

$$f_1^1 = r_L/\phi_K(1 - \tau)$$

$$f_2^1 = -D^c/\phi_K(1 - \tau)$$

$$f_3^1 = L/\phi_K(1 - \tau).$$

Provided that r_L is positive and L exceeds D^c, we have, as noted above in (9) and (10), $f_1^1 > 0$ and $(f_2^1 + f_3^1) > 0$.

Landowners

The nonfirm private sector does not receive loans and is restricted in its asset choices to bonds and money. For landowners, optimizing behavior requires that asset demands satisfy

$$\rho\{V[v(1 - \tau) + r_d D^v + r_b B^v, D^v]\} = r_b \tag{13}$$

$$\frac{V_D[v(1 - \tau) + r_d D^v + r_b B^v, D^v]}{V_E[v(1 - \tau) + r_d D^v + r_b B^v, D^v]} = r_b - r_d \tag{14}$$

where v stands for income from land rents. Equations (13) and (14) yield

$$B^v = f^2[r_b, r_d, v(1 - \tau)] \tag{15}$$

$$D^v = h^v(r_b, r_d), \tag{16}$$

where

$$f_1^2, h_2^v > 0; f_2^2, f_3^2 < 0; h_1^v \gtrless 0; h_1^v + h_2^v > 0; f_1^2 + f_2^2 < 0; f_1^2 > -h_1^v .$$

Bonds play the same role in the landowner's portfolio that capital does in the family firm's portfolio. The real bond rate fixes the time preference rate so that, in the long run, increases in after-tax rental income induce bond decumulation but do not alter real deposit holdings. Note also that there is a positive relation between savings and the real bond rate, as reflected in the fact that steady-state wealth increases with r_b $(f_1^2 + h_1^v > 0)$.

The impact of variations in real returns is largely as expected. An increase in the real deposit rate induces substitution away from bonds toward deposits. A higher real bond rate, however, may increase the demand for both assets. Real deposit holdings rise or fall with r_b depending on whether

$$(\sigma + \gamma)(1 - r_d/r_b) \gtrless \eta, \tag{17}$$

where $\sigma \equiv V_{DE}E^v/V_D > 0$, the elasticity of the marginal utility of deposits with respect to real consumption expenditure; $\gamma \equiv -V_{EE}E^v/V_E$, the "partial" Arrow-Pratt measure of relative risk aversion (i.e., γ is defined for a given value of D^v); and $\eta \equiv (\partial\rho/\partial E)E/\rho$ is the elasticity of time preference with respect to real consumption expenditure.[7] In what follows, I assume that ρ is strictly concave in C so that $\eta < 1$.

A rise in r_b makes it more costly to hold money in financial terms but also leads to a higher level of steady-state consumption, which increases the marginal utility of the nonpecuniary benefits of money relative to the marginal utility of goods ($V_{DE} > 0$, $V_{EE} < 0$). If η is relatively small, a large increase in consumption is required to bring ρ up to the higher value of r_b and the latter, positive effect is likely to dominate the former, negative effect. On the other hand, when η is relatively large, steady-state consumption rises little and the larger spread in financial returns causes a reduction in deposit holdings. In general, there is no clear presumption as to the sign of h_1^v. Although η must be less than unity, relatively little is known about the magnitudes of σ and γ. Even if existing estimates of relative risk aversion are taken as evidence that $(\sigma + \gamma)$ will range between 1 and 3, the left side of (17) may be below unity when the initial interest rate spread is not too large.

A feature of the asset demands that will figure importantly in future results is the relative magnitudes of the own- and cross-price effects. The own-price effect is larger than the cross-price effect for deposits, but the reverse is true for bonds. Overall, however, own-price effects dominate cross-price effects. It is readily demonstrated (see the app.) that

$$f_1^2 h_2^v > f_2^2 h_1^v.$$

Workers

Due to a high rate of time preference and/or fixed transactions costs that absorb most of the return on small bond purchases, workers allocate all of their wealth to money. Unlike capitalists and landowners, their transactions needs are such that they hold significant quantities of both deposits and currency, C. The representative worker's indirect utility function is of the form $V(E^w, D^w, C)$ and has the properties:

$$V_E, V_D, V_C, V_{ED}, V_{EC} > 0; V_{CD}, V_{EE}, V_{CC}, V_{DD} < 0;$$
$$V_{CC} - V_{DC} < 0; V_{DD} - V_{CD} < 0.$$

The negative sign for V_{CD} signifies that the two monies are substitutes as mediums of exchange. We assume as well that increases in E do not alter the nonpecuniary benefits of deposits relative to those of currency:

$$V_C - V_D = \zeta(D, C), \quad \zeta_D > 0, \zeta_C < 0. \tag{18}$$

Workers' holdings of deposits and currency are determined by the conditions that

$$\frac{V_D[Y^w(1 - \tau) + r_d D^w - \pi C, D^w, C]}{V_E[Y^w(1 - \tau) + r_d D^w - \pi C, D^w, C]} = \rho\{V[Y^w(1 - \tau) + r_d D^w - \pi C, D^w, C]\} - r_d \tag{19}$$

$$\frac{\zeta(D^w, C)}{V_E[Y^w(1 - \tau) + r_d D^w - \pi C, D^w, C]} = r_d + \pi. \tag{20}$$

The marginal nonpecuniary benefits of deposits are equated to the net price of deposits, $\rho - r_d$. Currency is accumulated up to the point at which its marginal nonpecuniary benefits exceed those of deposits by an amount equaling the nominal deposit rate.

In the general solution for the asset demands, the signs of both cross-price terms ($\partial C/\partial r_d$ and $\partial D^w/\partial \pi$) are uncertain owing to conflicting income and substitution effects. Maintaining r_d as the inflation rate rises, for example, may not increase deposit holdings; for while an increase in the nominal deposit rate induces substitution toward deposits, the higher inflation tax lowers real steady-state consumption, which exerts a countervailing contractionary effect.

To abstract from the ambiguous cross-price effects, I work with special versions of the general solution in which the demand for each asset depends upon total after-tax wage income and its own return:

$$D^w = h^w[Y^w(1 - \tau), r_d] \tag{21}$$

$$C = g[Y^w(1 - \tau), \pi] \tag{22}$$

where

$$h_1^w, h_2^w, g_1 > 0, \quad g_2 < 0.$$

The critical implication of neglecting cross-price effects is that to promote financial intermediation, the government must offer the public a higher real deposit rate. Merely pegging the real deposit rate in the face of higher inflation will not suffice.

7.1.4 Aggregate Asset Demands and Asset-Market Equilibrium

The real bond rate adjusts to ensure that the stock of outstanding bonds supplied by the government is willingly held. Combining the demand of banks and landowners, we have the market-clearing condition

$$B = k_b D + f^2[r_b, r_d, v(1 - \tau)]. \tag{23}$$

The real bond rate is the only market-determined interest rate in the economy. All other asset stocks reach their long-term equilibrium values through quantity variation; investment by family firms and financial savings of the public bring K, D, and C to their desired levels. Aggregating D^w, D^c and D^v and using (4), the general equilibrium solutions for D and C may be expressed as

$$D = D[Y^w(K, N^g, w^g)(1 - \tau), r_d, r_b, \tau] \tag{24}$$

$$C = C[Y^w(K, N^g, w^g)(1 - \tau), \pi], \tag{25}$$

where

$$D_1, C_1, D_2 > 0, \quad C_2 < 0, \quad D_3, D_4 \gtrless 0.$$

Since workers' holdings of deposits increase with their income, capital accumulation and financial intermediation are interdependent, mutually reinforcing processes. Growth of the capital stock raises total wage income and real deposits which, in turn, expands the supply of bank loans and lowers r_b. The expansion in bank lending stimulates further capital accumulation, which leads to further financial deepening, and so on. To ensure that capital accumulation, deposit accumulation, and fluctuations in the real bond rate do not feed back upon one another in an unstable manner, it is assumed that

$$\begin{aligned} \text{(26a)} \qquad e_0 &\equiv 1 - f_1^1(1 - k)D_1 Y_1^w(1 - \tau) \\ &= 1 - \beta_d(\theta_L^m/\theta_K^m) \\ &\quad (1 - w^x/w^m)r_L(1 - k)D^w/Y^w(1 - \tau) > 0 \end{aligned}$$

$$\begin{aligned} \text{(26b)} \qquad e_1 &\equiv f_1^2[1 - f_1^1 x D_1 Y_1^w(1 - \tau)] + k_b D_3 \\ &= f_1^2[1 - \beta_d(\theta_L^m/\theta_K^m) \\ &\quad (1 - w^x/w^m)r_L x D^w/Y^w(1 - \tau)] + k_b D_3 > 0, \end{aligned}$$

where θ_j^m denotes the cost share of factor j in the manufacturing sector and β_d stands for the elasticity of D^w with respect to after-tax wage income. The first restriction ensures that the capital accumulation multiplier is finite when the bond market does not exist (or when open-market operations peg the real bond rate). The second is necessary and sufficient to guarantee stability of the adjustment process when r_b fluctuates to clear the bond market. This restriction requires that bonds and deposits not be overly strong substitutes.

7.1.5 The Government Budget Constraint

The government makes outlays for employment, consumption, internal and external debt service, and to cover the losses of the banking system. External debt service net of long-term capital inflows and concessional aid equals S in real terms and is treated as strictly exogenous.[8] Public sector income consists of revenue from the value-added tax and sales of government-produced goods and services.[9] Any revenue shortfall is covered by printing money M or selling bonds:

$$\begin{aligned} \dot{M} + \dot{B} &= G + w^g N^g + S + r_b B - Z \\ &\quad - \tau Y^p(K, N^g, w^g) - F(N^g) - \pi M, \end{aligned}$$

where an overdot signifies a time derivative. Since M and B are constant in a steady state, satisfaction of the budget constraint requires an inflation tax of

$$\text{(27)} \quad \pi M = G + w^g N^g + S + r_b B - Z - \tau Y^p(K, N^g, w^g) - F(N^g).$$

As the asset preferences and saving behavior of the public determine only M and either B or r_b, there are a number of different ways in which budget balance can be achieved. For the most part, I will treat B and $(G + S)$ as exogenous and assume that the inflation rate is manipulated along with other policies (k, k_b, etc.) to satisfy (27).

While equation (27) is the standard representation of the government budget constraint, in the current context it conceals rather more than it reveals. When the government owns the banking system, *net* revenue from the inflation tax depends in part on how bank interest rates are managed. We assume that the government pegs the real deposit and real loan rates and treat any changes in r_d and r_L accompanying fluctuations in the inflation rate as separate, conscious policy decisions. The crucial point to note is that under this interest rate policy, the net revenue gain from *raising* π is limited to just the increase in revenue from the higher inflation tax on currency holdings; the higher inflation tax on bank reserves is nullified by greater losses on bank operations.[10] To see this, substitute for Z in (27) from (7) and decompose M into bank reserves (kD) and currency. We then have

$$(28) \qquad \pi C = G + S + w^g N^g + r_b B - [r_L x + r_b k_b - r_d]D - \tau Y^p(K, N^g, w^g) - F(N^g).$$

The right side of (28) shall be referred to as the *adjusted* fiscal deficit.

A second important and obvious link connecting financial policy and the fiscal deficit arises through net losses incurred by the banking system. We assume, generously, that the deficit on financial intermediation (Z) is initially zero. This implies that *initially*

$$(r_L x + r_b k_b - r_d)D = \pi k D.$$

Thus, an asymmetry exists: although higher inflation taxes only C, it remains true that growth in bank reserves (kD) increases the revenue yield of the inflation tax.[11]

7.1.6 Characterizing the Steady-State Equilibrium

As a first step toward characterizing the steady-state equilibrium, replace D in (23) by the solution in (24) and solve for r_b:

(29)

$$(f_1^2 + k_b D_3)dr_b = dB - k_b D_1(1 - \tau)(w^m - w^x)\ell dK - k_b D_1(1 - \tau)(w^g - w^x)dN^g - k_b D_1(1 - \tau)N^g dw^g - (f_2^2 + k_b D_2)dr_d + [f_3^2 v + k_b(D_1 Y^w - D_4)]d\tau.$$

The supply of deposits effectively determines bank bond demand. Since higher total wage income results in greater deposit holdings, increases in K, w^g, and N^g all lower r_b. The inverse, general equilibrium relation between K and r_b is represented by the negatively sloped RR schedule in the second quadrant in figure 7.1.

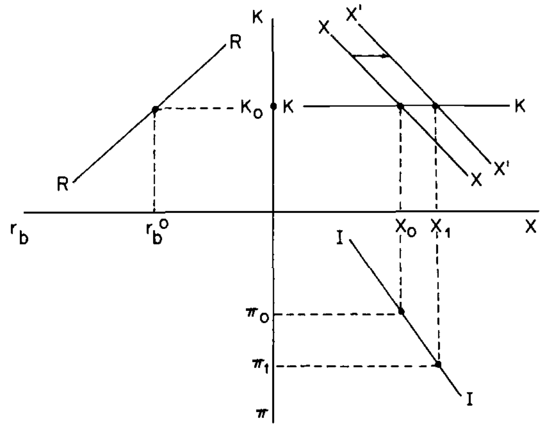

Fig. 7.1 The steady-state equilibrium

The degree of financial intermediation influences capital accumulation as well as the real bond rate. Substituting for L in (11) from (6) and (24) gives

(30)

$$\begin{aligned} e_0 dK = {} & (f_1^1 x D_2 + f_2^1) dr_d + f_3^1 dr_L + [f_1^1 x (D_4 - D_1 Y^w) + f_4^1] d\tau \\ & + f_1^1 x D_1 N^g (1 - \tau) dw^g + f_1^1 x D_1 (w^g - w^x)(1 - \tau) dN^g - f_1^1 D dk \\ & - f_1^1 D dk_b + f_1^1 x D_3 dr_b \, . \end{aligned}$$

Equations (29) and (30) can be solved simultaneously for K and r_b as a function of the policy variables r_L, r_d, k_b, k, w^g, N^g, and τ. This enables the general solution for K to be written as

(31) $$K = H(r_d, r_L, \tau, k, k_b, w^g, N^g).$$

With the solutions for K and r_b in hand, the steady-state inflation rate can be pinned down through the government budget constraint. Let $X \equiv \pi C$, the inflation tax on currency holdings. Making use of (25), one obtains

(32)

$$\begin{aligned} dX = {} & (1 - \mu_c) C d\pi + \pi C_1 (1 - \tau)(w^m - w^x) \ell dK \\ & + \pi C_1 (1 - \tau) N^g dw^g + \pi C_1 (1 - \tau)(w^g - w^x) dN^g - \pi C_1 Y^w d\tau \, , \end{aligned}$$

where $\mu_c \equiv -\pi C_2 / C$, the elasticity of currency demand with respect to the inflation rate. The II schedule in the fourth quadrant of figure 7.1 is based on (32) and shows how X varies with π for given values of K, τ, w^g, and N^g. Since I am not interested in the well-known stability problems which arise when higher inflation lowers seignorage, μ_c is restricted to be less than unity and II is positively sloped throughout.

Exactly where the economy locates along the *II* schedule depends on the state of the fiscal budget. Recall that revenue from the *currency* inflation tax must suffice to cover the *adjusted* budget deficit as given by the right side of (28). This provides a second relation involving X:

$$
\begin{aligned}
(33) \quad dX = {} & d(G + S) + (D - \pi k D_2)dr_d - xDdr_L + r_L Ddk \\
& - (r_b - r_L)Ddk_b + r_b dB - \{\tau r_K + (w^m - w^x)\ell[\tau \\
& + \pi k D_1(1 - \tau)]\}dK - \{Y^p - \pi[C_1 Y^w + k(D_1 Y^w - D_4)]\}d\tau \\
& + (B^v - \pi k D_3)dr_b + [w^g - F' - (w^g - w^x) \\
& (\tau + \pi k D_1)]dN^g + (1 - \pi k D_1)N^g(1 - \tau)dw^g .
\end{aligned}
$$

Capital decumulation worsens the adjusted budget deficit both by lowering tax revenues and reducing real deposit holdings (which diminishes the base of the overall inflation tax). The *XX* schedule in the first quadrant is thus negatively sloped. *XX* is defined for given values of S, the entire set of policy variables, *and* r_b. Shifts of or movements along the *RR* schedule will, therefore, produce shifts in *XX*. The ambiguous sign of the coefficient on r_b is due to the fact that while a higher bond rate worsens the fiscal deficit by raising interest payments to the nonbank public, it also expands the monetary base if bonds and deposits are complements in landowners' portfolios ($D_3 > 0$). As it seems clear that higher real bond rates intensify inflationary pressures in Mexico, I ignore the opposite possibility by assuming $D_3 < B^v/\pi k$—that is, bonds and deposits are not extremely strong complements.

The graphical depiction of the steady-state equilibrium is completed by using the reduced form solution for K in (31) to fix the position of the *KK* schedule.[12] Since $X = \pi C$ and the steady-state capital stock is independent of both C and π when the government pegs r_d and r_L, *KK* is horizontal. Associated with a given *KK* schedule are a particular *II* schedule in the fourth quadrant and a particular equilibrium bond rate, which fixes the position of the *XX* schedule.

The intersection point of *KK* and *XX* determines the size of the adjusted fiscal deficit and hence the required currency inflation tax. Once X is known, the steady-state inflation rate is found by dropping a vertical line to the *II* schedule. The corresponding mathematical procedure involves using (29) and (31) to eliminate K and r_b in (32) and (33). The resulting two equations can then be solved to obtain the reduced-form solutions for X and π.

7.2 Fiscal Adjustment and Debt Service

Suppose the government is faced with increased debt service obligations (or a reduction in oil revenues). If real bank interest rates (r_d and r_L) are maintained and none of the instruments of fiscal policy (G, w^g, N^g, and τ) is altered, the entire burden of adjustment falls upon the inflation tax and we have the outcome shown in figure 7.1. The shock simply shifts the XX schedule to the right. Neither K nor r_b changes, and the inflation rate rises from π_0 to π_1.

Apart from its ugly distributional effects—workers alone pay the costs of adjustment—the main drawback of responding so passively to the external shock is, unsurprisingly, that the inflation rate increases very strongly. From (32) and (33):

$$d\pi = \frac{dS}{C(1 - \mu_c)}. \tag{34}$$

Under a policy of pegging real bank rates, the base for marginal increases in the inflation tax is very small and the shock will prove highly inflationary even when μ_c is well below unity. In Mexico in 1986, currency held by the public was just 3.1 percent of GDP (calculated using the average of the beginning and end-of-year currency holdings). With this value for C/GDP and $\mu_b = 0.33$, an increase in debt service equalling only 2.5 percent of GDP implies a long-run increase in the inflation rate of 120 percentage points.

In the foregoing I assumed that nominal bank interest rates were actively adjusted so as to keep real interest rates fixed. In fact, since 1972, the Mexican government has frequently allowed high or rising inflation to substantially reduce real deposit and real loan rates. By contrast, during the era of Stabilizing Development when single-digit inflation prevailed, real bank interest rates were consistently positive and above U.S. rates.

It is not too difficult to see why policymakers are tempted to follow a more passive interest rate policy when the government owns the banking system. Note that in pegging the real deposit and loan rates, the deterioration in the *actual* budget deficit caused by the external shock is magnified by an increase in the deficit on financial intermediation of $kDd\pi$ (see [7]). Under pressure to contain the growing fiscal deficit, the government may abandon its commitment to maintain real bank rates. Another source of temptation may be the hope that a lower real deposit rate will indirectly ease budgetary difficulties by putting downward pressure on the real bond rate and reducing interest payments on the internal debt.

To ascertain whether a more passive interest rate policy will help blunt inflationary pressures, consider the consequences of equal decreases in the real deposit and real loan rates: $dr_d = dr_L = -dg$. (A pure nominal interest policy corresponds to $-dg = -d\pi$.) Equation (33) gives

$$dX = -[B^b + kD(1 - \pi D_2/D)]dg$$

for the direct impact on the adjusted budget deficit. Provided the semi-interest elasticity of deposit demand (D_2/D) is not too large, the direct impact upon the budget is favorable.

But this is by no means the end of the story. The steady-state capital stock declines:

$$(35)\quad \frac{dK}{dg} = [f_1^1x(f_2^2D_3 - f_1^2D_2) - (f_1^2 + k_bD_3)(f_2^1 + f_3^1)]/e_1 < 0$$

since $(f_2^1 + f_3^1) < 0$ and the own-price effects are larger than the cross-price effects $(f_1^2D_2 > f_2^2D_3)$.[13] The parallel decrease in deposit and loan rates directly induces capital decumulation by raising real income of capitalist family firms, who are net debtors of the banking system. In addition, as the supply of deposits shrinks, bank lending is curtailed. This gives rise to further capital decumulation as reflected in the first term involving f_1^1.

The decrease in the capital stock lowers real output and total wage income, causing tax revenues and real currency holdings to decline. Furthermore, the real bond rate, instead of falling together with r_d, is almost certain to rise, adding a third source of countervailing inflationary pressure. Substituting the solution for K into (29) yields

$$(36)\quad dr_b/dg = [k_bD_1(f_1^1xD_2 + f_2^1 + f_3^1) + (f_2^2 + k_bD_2)(1 - f_1^1xD_1)]/e_1 .$$

The first positive term captures the reduction in bank bond demand stemming from the reduction in wage income and deposit holdings occasioned by capital decumulation. In the second term, the sign of $(f_2^2 + k_bD_2)$ determines whether, in the aggregate, bonds and deposits are complements or substitutes. A decrease in r_d induces substitution toward bonds on the part of landowners in the amount f_2^2, but banks, finding themselves with fewer funds, are forced to lower their bond purchases by k_bD_2. The latter effect is the stronger one when

$$(37)\quad \mu_d > -\alpha_d B^v/B^b ,$$

where μ_d and α_d are, respectively, the elasticities of total deposit demand and private sector bond demand (i.e., landowners' demand) with respect to r_d.[14] The above condition is virtually certain to hold; μ_d, an own-price elasticity, will normally exceed α_d a cross-price elasticity and, in the Mexican case, B^v/B^b is much smaller than unity ($B^v/B^b = 0.096$ in 1985).

With the real bond rate higher and tax revenues and real currency holdings lower, it is not at all improbable that, after the dust settles, the inflation rate will increase. Figure 7.2 depicts one possible scenario. Capital decumulation shifts the *KK* schedule down to *K'K'* and *II* inward to *I'I'*. Equation (37) is satisfied so that the *RR* schedule shifts to the left and the real bond rate rises from r_b^0 to r_b^1. The increase in r_b partially offsets the initial leftward shift of the *XX* schedule and, together with the decrease in tax revenues and deposit holdings, produces a larger adjusted fiscal deficit. The larger deficit, reinforced by the reduction in real currency holdings, drives the inflation rate up to π_1.

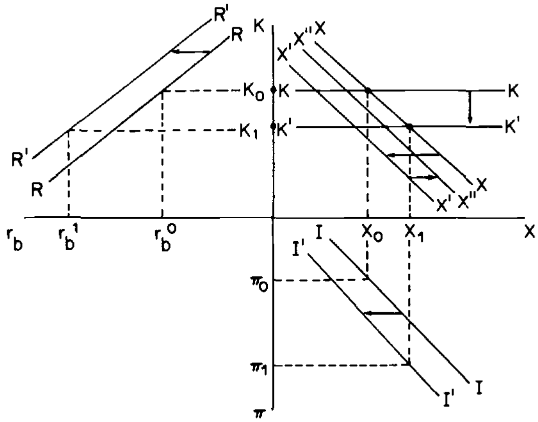

Fig. 7.2 The effect of equal decreases in the real deposit and real loan rates

7.2.1 Tax Policy and Current Expenditure Cuts

As figures 7.1 and 7.2 clearly demonstrate, an increase in debt service creates grave macroeconomic problems when fiscal policy remains passive. If the government weakens in its resolve to maintain real bank interest rates, the economy is thrown into a cumulatively reinforcing spiral of accelerating inflation, rising real interest rates on the internal debt, capital decumulation, and financial disintermediation. This vicious cycle can be averted by pegging real interest rates, but the inflation rate is still certain to increase strongly. The simplest and most effective way out of these difficulties is to cut government *consumption* expenditures by an amount equalling the increase in debt service. This leaves private disposable income unchanged and keeps the fiscal budget in balance, thereby preserving the initial equilibrium.

Other types of fiscal adjustment are *not* adequate substitutes for reducing government consumption spending. Consider first the repercussions of cutting the real public sector wage. The government wage bill decreases and workers reduce their holdings of both currency and deposits, so the *XX* and *II* schedules shift leftward to *X'X'* and *I'I'* in figure 7.3. From (32) and (33) it is seen that the overall direct effect is deflationary under the weak assumption that[15]

$$\beta_c z_1 + \beta_d z_2 < 1,$$

where β_c and β_d are, respectively, workers' elasticities of currency and deposit demand with respect to after-tax wage income; $z_1 \equiv \pi C/Y^w(1 - \tau)$, the currency inflation tax as a fraction of after-tax wage income; and $z_2 \equiv \pi kD^w/Y^w(1 - \tau)$, the inflation tax on "attributed" reserve holdings (kD^w) as a fraction of after-tax wage income.

Presumably it is this sort of partial equilibrium analysis that leads the IMF to tirelessly extol the virtues of slashing public sector wages. In general

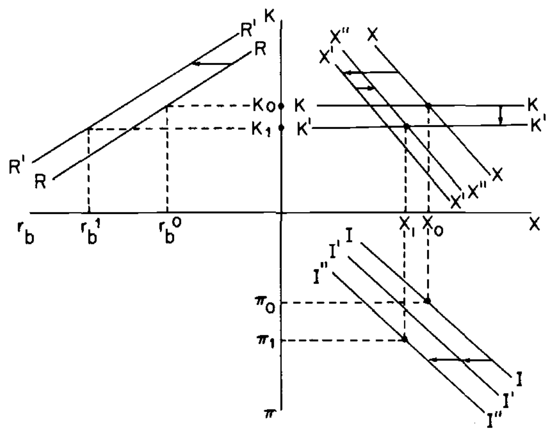

Fig. 7.3 The effect of a public sector real wage cut

equilibrium, however, matters look quite different. Banks are compelled by the withdrawal of deposits to sell off some bonds and call back some of their private sector loans, shifting KK down to $K'K'$ and RR outward to $R'R'$. The decrease in the capital stock provokes a second inward shift of the II schedule, while lower tax revenues and a higher real bond rate work to reverse the favorable impact of the wage cut on the fiscal deficit. In figure 7.3 the adjusted (and actual) fiscal deficit still declines, but, due to a relatively large decrease in C, a higher inflation rate is required to collect the smaller inflation tax (πC). More generally, the necessary and sufficient condition for π to increase is

$$(38) \quad \alpha_b\{1 - \beta_c z_1 - \beta_d z_2 - \beta_d z_3[\tau\theta_K^m + \theta_L^m(1 - \psi)]/\theta_K^m(1 - \tau)\} + (1 - \beta_c z_1)\epsilon_b k_b D^v/B^v - \beta_d z_4 < 0,$$

where $z_3 \equiv r_L x D^w/Y^w(1 - \tau)$; $z_4 \equiv r_b k_b D^w/Y^w(1 - \tau)$; α_b is the own-price elasticity of private sector bond demand $[(\partial B^v/\partial r_b)r_b/B^v]$; and ϵ_b is the elasticity of landowners' deposit demand with respect to r_b. In light of (38), an eventual increase in the inflation rate cannot be judged unusual, particularly when α_b is relatively small (making the RR schedule relatively flat) and bonds and deposits are substitutes ($\epsilon_b < 0$).

Public sector layoffs ($N^g \downarrow$) have effects qualitatively identical to public sector wage cuts except insofar as it is necessary to take account of possible differences in the productivity of public and private sector employment. K always decreases, r_b always increases, and if public sector employment is governed by the shadow-pricing rule, $F' = w^x$, (38) again determines whether π rises. On the other hand, when public sector employment is too high initially ($F' < w^x$), the inflation rate is more likely to decline (the budgetary impact is more favorable) and the layoffs generate a direct efficiency gain (of $[w^x - F']$) that has to be weighed against the output loss owing to capital decumulation.

The last alternative is to raise the value-added tax. This is very risky.[16] Workers reduce their currency and deposit holdings and landowners increase their bond purchases. The direct impact on capital accumulation and deposit demand of the family firm, however, is ambiguous as a higher value for τ lowers both the real return on capital and the time preference rate. And the general equilibrium outcome is yet more uncertain because it is necessary to make allowance for the effects of the change in the real bond rate (which may rise or fall). The one result that can be established is: if the family firm's time preference rate is relatively inelastic with respect to real consumption (η is small) and bonds and deposits are substitutes in landowners' portfolios ($D_3 < 0$), then a higher tax rate will induce capital decumulation.

While our analysis of different fiscal policies suggests that higher debt service should be countered by reductions in real government consumption expenditures,[17] in practice it may be unrealistic to expect the entire burden of adjustment to be borne by this single instrument, particularly in the Mexican case where the combined impact on the fiscal deficit of higher debt service and lower oil revenues has been extremely large. If the political will does not exist to enforce large-scale cuts in government consumption, additional instruments will have to be used to extract the larger trade balance surplus required to service the debt. A higher inflation tax, of course, has been one of the main instruments supplementing fiscal adjustment. The Mexican government has also, however, made strong efforts to stem inflationary pressures by recourse to a variety of other policies. In my view, all of these "supplementary" policies have slowed growth by reducing the incentives for capital accumulation and possibly exacerbated inflationary pressures over the medium and long run. In the next four sections, each of these policies is examined in isolation to highlight their distinctive effects.

7.3 Higher Reserve Requirements

The idea behind imposing high reserve requirements is to engineer a decrease in the inflation rate by strengthening the demand for the monetary base. No doubt this policy will temporarily lower the inflation rate, but it also provokes capital decumulation and *must* raise π in the long run. When k is increased, the supply of bank loans contracts and the steady-state capital stock declines from K_0 to K_1 in figure 7.4. Moreover, the reduction in government loan revenue worsens the deficit on financial intermediation, causing the XX schedule to shift rightward to $X'X'$. This is an example of

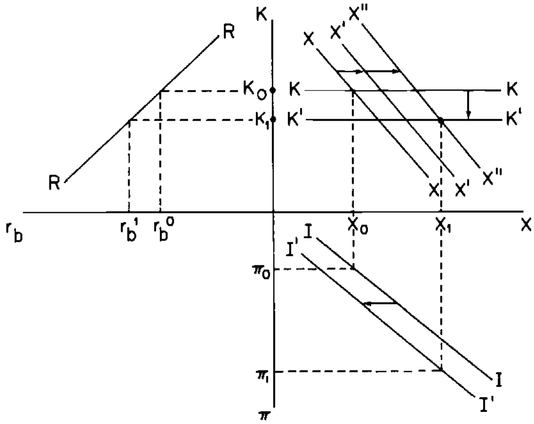

Fig. 7.4 The effect of a higher reserve requirement

what Sargent and Wallace (1986) have called "some unpleasant monetarist arithmetic"—ceteris paribus, less government lending to (or more borrowing from) the private sector is ultimately inflationary.

In moving to the new stationary equilibrium, the inflationary problems arising from the larger deficit on financial intermediation are compounded by a higher real bond rate that swells interest payments on the internal debt, lower tax revenues, and a smaller level of real currency holdings. Consequently, in the long run, a restrictive credit policy not only lowers real output and increases the extent of underemployment but is also massively inflationary.

What underlies the strong result that inflation invariably increases is the assumption that fluctuations in the deficit on financial intermediation lead to equivalent, endogenous swings in the overall fiscal deficit. I believe this is the most realistic representation of the fiscal process in Mexico; it may be argued, however, that the expenditure variable the government manipulates is total spending net of subsidies to cover losses of the banking system. That is, in the government budget constraint (27), perhaps one ought to combine G and Z into the single policy-controlled variable G^*.

Under this specification of the fiscal process, a higher reserve requirement exerts no direct, adverse effect upon the budget since other expenditure cuts fully offset the larger deficit on financial intermediation. Nonetheless, the policy may still fail. It can be demonstrated that when bonds and deposits are substitutes, the lower capital stock and higher real bond rate may well cause the real monetary base to decline instead of increase.[18] This possibility is illustrated in figure 7.5.

Even when a higher reserve ratio succeeds in strengthening the demand for the monetary base, however, there is no guarantee that the inflation rate

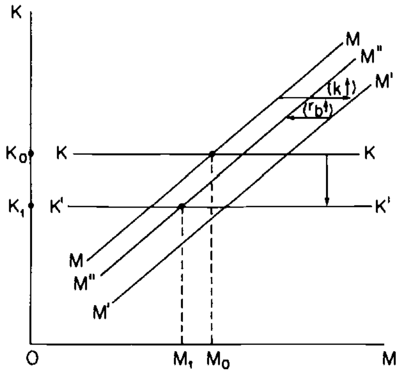

Fig. 7.5 The effect of a higher reserve requirement when losses of the banking system are offset by cuts in government consumption

will fall. Lower tax revenues and higher interest payments on the internal debt may raise the fiscal deficit by an amount exceeding the increase in revenue from the inflation tax. For the inflation rate to end up higher in the new steady state, it is necessary only that

$$
\begin{aligned}
(39)\quad & (B^v\alpha_b + k_b\epsilon_b D^v)\{\tau r_L(1 - \psi\theta_L^m)/\theta_K^m(1 - \tau) \\
& - \pi[1 - \beta_c(1 - \psi)\theta_L^m r_L C/\theta_K^m Y^w(1 - \tau)]\} + [\alpha_b B^v\pi(1 - k_b) \\
& + Bk_b]\beta_d(1 - \psi)\theta_L^m r_L D^w/\theta_K^m Y^w(1 - \tau) > 0.
\end{aligned}
$$

The first term is likely to be negative when π is moderately high (note that $f_1^2 + h_1^v > 0$ implies $B^v\alpha_b + k_b\epsilon_b D^v > 0$), but could easily be overwhelmed by the second positive term.

7.4 Enforced Bank Purchases of Government Bonds

The high interest rates paid on short-term treasury notes (CETES) and other types of government paper have become a major policy issue in Mexico. It is widely felt that the high rates have acted as a strong deterrent to private sector investment and been an important factor fueling growth of the fiscal deficit.[19] In recent years, the Mexican government has attempted to bring down interest rates by requiring commercial banks to reserve a larger fraction of their total investible funds for the purchase of various government financial instruments (principally CETES).

This heavy-handed policy can easily backfire for the same reason that higher reserve requirements may be counterproductive. Diverting bank credit from the private to the public sector shifts the *RR* schedule to the right in figure 7.6 but also lowers the steady-state capital stock:

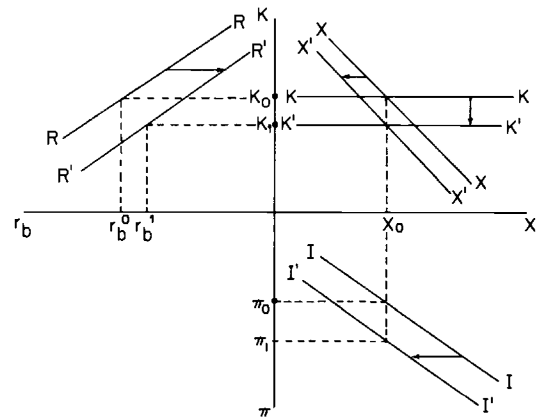

Fig. 7.6 The effect of an increase in mandatory bank purchases of government bonds

(40)
$$\frac{dK}{dk_b} = -f_1^1 D[f_1^2 + h_1^v(1 - k)]/e_1 < 0.$$

Capital decumulation moves the economy southwest along $R'R'$, but stops short of the point where r_b rises:

(41)
$$\frac{dr_b}{dk_b} = -De_0/e_1 < 0.$$

In view of the drop in tax revenues and the erosion of the real monetary base which accompany capital decumulation, there is no general expectation that the inflation rate will decrease in the long run. For simplicity, suppose $r_b = r_L$ initially. In this case, π increases if

(42)
$$\alpha_b[\tau(1 - \tau)^{-1}(1 - \psi\theta_L^m) + (\beta_c z_1 + \beta_d z_2(1 - \psi)\theta_L^m]$$
$$+ \epsilon_b(1 - k)\frac{D^v}{B^v}[\tau(1 - \tau)^{-1}(1 - \psi\theta_L^m) + z_1(1 - \psi)\theta_L^m]$$
$$+ \beta_d z_5(1 - \psi)\theta_L^m > \theta_K^m\left(1 - \frac{\epsilon_b \pi k D^v}{r_b B^v}\right),$$

where

$$z_5 \equiv r_b(1 - k)D^w/Y^w(1 - \tau).$$

A wide set of plausible parameter values satisfy (42). In fact, when bonds and deposits are complements ($\epsilon_b > 0$), there is, if anything, a presumption that π will increase. Figure 7.6 portrays the outcome in the special case where lower interest payments on the internal debt, lower tax revenues, and lower deposit holdings cancel out, leaving the adjusted fiscal deficit unchanged. The inflation rate then rises because the same amount of revenue from the currency inflation tax must be extracted from a smaller stock of currency holdings.

7.5 Bond Financing of the Deficit

Reduced monetization of the fiscal deficit has been an important element in the anti-inflation program of the De La Madrid administration. Between 1982 and 1986, the real stock of high-powered money decreased 33.6 percent while real bond sales (CETES and petrobonds) from the federal government to the nonbank private sector rose 25.6 percent.[20]

Whether it is wise to substitute bond for money financing of the fiscal deficit depends largely on whether bonds and deposits are complements or substitutes in private sector portfolios. In the borderline case where deposit demand is independent of the real bond rate, π increases but neither the capital stock nor real output changes. This is another instance of Sargent and Wallace's "unpleasant monetarist arithmetic." Bond sales tend to be inflationary since they increase interest payments on the internal debt.

When bonds and deposits are substitutes, the adverse macroeconomic effects are much more serious. Figure 7.7 shows what goes wrong. The bond sale forces up r_b, inducing substitution out of deposits, a reduction in bank loans, and capital decumulation. Real output falls and the inflation rate increases strongly as higher interest payments and lower tax revenues enlarge the fiscal deficit at the same time that the demand for the monetary base contracts.

Finally, if the two assets turn out to be complements instead of substitutes, a case can be made for greater bond financing of the deficit. With asset complementarity, a higher real bond rate eventually elicits a higher level of

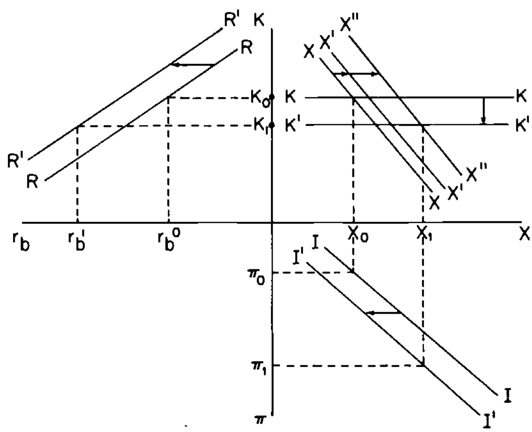

Fig. 7.7 The effect of a bond sale

real bank deposits and financial deepening. Hence, the capital stock increases and the inflation rate may possibly decline.

7.6 Cutbacks in Public Sector Infrastructure Investment

It was stressed earlier that reductions in government consumption spending are the best means of minimizing the adverse long-run effects of debt service. Though the Mexican government has made strong efforts in this direction, the reductions in public sector investment spending have been even more severe. Few objections can be made against retrenchment in the inefficient parastatal sector, but the deep cutbacks in social infrastructure investment are troublesome. Like so many of the other post-1982 policies, this latter policy seems very shortsighted; it eases inflationary pressures in the short run to the detriment of the macroeconomic tradeoffs facing the economy over the medium and long run.

The model is easily modified to incorporate infrastructure capital that is complementary with private capital. Interpret S now as social infrastructure investment. Since net investment is zero in steady-state equilibrium, $S = \delta J$ in (33), where δ is the depreciation rate and J is the stock of infrastructure capital. Also, in keeping with the notion that the primary role of infrastructure capital is to promote private investment, assume

$$\phi_{wJ} = \phi_J = \phi_{KK} = 0, \quad \phi_{KJ} > 0.$$

An increase in J raises the marginal productivity of private sector capital but does not directly affect output ($\phi_J = 0$) or labor demand ($\phi_{wJ} = 0$).[21]

It can be confirmed from (9) and (10) that if either (i) an exogenous increase in time preference induces capital decumulation or (ii) $r_d \leqslant 0$, then a decrease in J lowers the steady-state capital stock. Assuming that one of these two weak, sufficient conditions holds, the cutback in spending on infrastructure investment shifts XX to $X'X'$ and KK to $K'K'$ in figure 7.8.[22] In what must be a by now familiar refrain, capital decumulation drives the economy to a new steady state in which real output and the monetary base are lower and the real bond rate is higher.

With K lower and r_b higher, the inflation rate may rise either because the demand for the monetary base contracts or because the fiscal deficit increases. It is particularly relevant that an increase in π can occur when the elasticity of K with respect to J is extremely small. For example, when deposit demand is independent of r_b ($D_3 = 0$), the necessary and sufficient condition for π to increase is

$$(43) \quad \lambda[\tau(1 - \psi\theta_L^m) + (1 - \psi)(1 - \tau)\theta_L^m(\beta_c z_1 + \beta_d z_2 + z_4/\alpha_b] > \frac{\delta J}{Q^m}(1 - \beta_d z_3 \theta_L^m/\theta_K^m),$$

where $\lambda \equiv (\partial f^1/\partial J)J/K$, the elasticity of K with respect to J. The bracketed

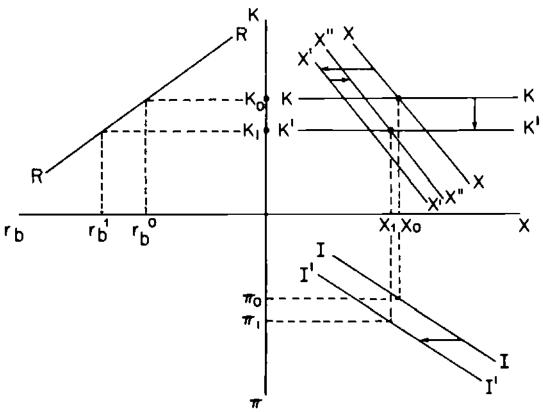

Fig. 7.8 The effect of a reduction in the stock of social infrastructure capital

term multiplying λ will usually be less than one-half (unless $\alpha_b < z_4$), but on the right side $\delta J/Q^m$ is an exceedingly small term, the "cost share" of public infrastructure depreciation allowances in manufacturing production. An increase in π is quite conceivable for values of λ on the order of 0.10.

7.7 Import Compression

Finally, to round out the analysis of import compression in chapter 6, consider the repercussions of tighter import quotas. When machinery imports are restricted, the real supply price of capital rises. If the implicit tariff is initially zero, there is no direct impact upon income of the family firm (up to a first-order effect) and the imposition of the quota affects K, r_b, and M much like a reduction in public sector infrastructure investment, except inflation always rises since there is no decrease in government expenditures.

A similar analysis applies to tighter quotas on imported intermediate inputs. On the usual assumption for factors are gross complements, import compression lowers the marginal productivity of both capital and labor. The contractionary supply-side effects are thus equivalent to a cutback in infrastructure investment combined with a direct, employment-reducing shock in the high-wage manufacturing sector.

7.8 Conclusions

Since 1982 Mexico has been burdened by a massive increase in debt service and adverse terms of trade. In this chapter I have examined a large number of different policy measures that could plausibly be used in adjusting to such shocks. My very pessimistic conclusion is that only sufficiently large cuts in government consumption expenditure will prevent the economy from descending into a severe stagflationary spiral.

The De La Madrid administration has not been able to institute the requisite expenditure cuts. In making this observation it is not my intent to belittle recent efforts at fiscal reform: the cutbacks in public sector absorption have been sizable but insufficient given the sheer magnitude of the deterioration in external conditions. But if adverse external conditions made it inevitable that stagflation would continue for a period after the 1982 debacle, it also seems that the stabilization program adopted by the administration to contain inflation was ill-conceived and has made the crisis deeper and more prolonged than necessary. A series of devastating blows have been dealt to private investment by imposing high reserve ratios, requiring banks to allocate a large share of their portfolio to the purchase of various government-issued assets, financing a greater part of the fiscal deficit through bond sales, cutting public sector employment and wages, and reducing expenditures to augment the stock of infrastructure capital. Furthermore, beyond the short run, such austerity policies are unlikely to bring much relief on the price front and may well make it more difficult to control inflation. Once lower investment takes its toll on the capital stock, real bond rates start rising, the demand for the monetary base weakens, and tax revenues grow more slowly, all of which reignite inflationary pressures.[23]

Unfortunately, it does not follow from these heterodox results that the cure for the current crisis is to lower reserve requirements and increase public sector wages, social infrastructure investment, and the growth rate of the money supply. Comparative steady-state analysis neglects difficulties that may arise from a deteriorating payments balance during the transition path. Obviously, all the aforementioned policies would increase absorption and thereby worsen the current account deficit over the "short run." Such policies are simply not feasible if initially the government's supply of foreign exchange reserves is uncomfortably low and the country lacks access to additional foreign borrowing. When due consideration is given to the foreign exchange bottleneck, one is much less inclined to be harshly critical of the De La Madrid administration's policies. If sociopolitical factors do in fact limit the extent to which public sector consumption can be cut, the real message of the analysis is that the arduous task of servicing the foreign debt has forced Mexico to adopt a set of austerity measures that promise only deepening stagflation for the foreseeable future.

Appendix

In this appendix, I specify the intertemporal optimization problem solved by each agent and then derive the agent's asset demands. All variables are expressed in real terms and agents' consumption expenditure and asset demands are distinguished by c, v, and w superscripts. For notational ease, superscripts are omitted for all other variables.

The Family Firm

Current utility, u, is represented by the indirect utility function, $V(E^c, D^c)$, where E^c is real consumption expenditure and D^c is real deposit holdings. Total real financial wealth of the family firm is $A \equiv D^c - L_o$, where L_o denotes real loan demand. The firm can borrow a maximum of L from the commercial banks and uses the loan proceeds and retained profits to finance additional accumulation of real deposits and physical capital. With Uzawa preferences, the optimization problem solved by the family firm is thus

$$\text{(A1)} \qquad \underset{\{D^c, I, E^c, S_f\}}{\text{Max}} \int_0^\infty [V(E^c, D^c) \exp - \int_0^t (u_s) ds] dt$$

subject to

$$\text{(A2)} \qquad E^c = \phi(K)(1 - \tau) + r_d D^c - r_L(D - A) - I - S_f$$

$$\text{(A3)} \qquad \dot{K} = I$$

$$\text{(A4)} \qquad \dot{A} = S_f$$

$$\text{(A5)} \qquad D - A \leq L,$$

where K is the capital stock; $\rho(u)$ is the variable time preference rate; I is investment; S_f is financial savings; r_d and r_L are the real deposit and real loan rates; and an overdot denotes a time derivative.

Equation (A2) is the family firm's budget constraint. Current period profits are determined by the restricted profit function, $\phi(K)$ (where the constant real wage w^m is suppressed). Capital does not depreciate and technology exhibits constant returns to scale so that $\phi_{KK} = 0$.

The next two equations specify the laws of motion for the capital stock and the stock of financial wealth, while (A5) represents the borrowing constraint. There are also nonnegativity constraints (not stated) on D^c and L_o.

After substituting for E^c in the indirect utility function and transforming the time variable as in Uzawa (1968), we have the following Lagrangean associated with the problem (A1)–(A5):

$$\text{(A6)} \qquad \underset{\{D^c, I, S_f\}}{\text{Max}} \sum = \frac{e^{-\beta}}{\rho(u)} \{V[\phi(K)(1 - \tau) + r_d D^c - r_L(D^c - A) - I - S_f, D^c] + \lambda_1 I + \lambda_2 S_f + \lambda_3(L + A - D^c)\},$$

where

$$\beta \equiv \int_0^t \rho(u_s)ds$$

and the λ_i are multipliers appended to the constraints (A3)–(A5).

In this control problem, there is a mixed inequality constraint involving both a control variable and a state variable ([A5]), and one of the state variables (A) can jump whenever the borrowing constraint is not binding. This makes for generally complicated first-order conditions. However, our main interest lies in steady-state comparisons in which L is fixed. For simplicity, I assume, therefore, that (A5) is continuously binding. (This is the case when $V_E[r_d - r_L] + V_D > 0$.) Optimality then requires

$$\text{(A7)} \qquad \lambda_3 = [V_E(r_d - r_L) + V_D](1 - \rho' F/\rho)$$

$$\text{(A8)} \qquad \lambda_1 = \lambda_2 = V_E(1 - \rho' F/\rho)$$

$$\text{(A9)} \qquad \mathring{\lambda}_1 = \lambda_1 - \rho^{-1} V_E \phi_K (1 - \tau)(1 - \rho' F/\rho)$$

$$\text{(A10)} \qquad \mathring{\lambda}_2 = \lambda_2 - \rho^{-1}[\lambda_3 + V_E r_L \rho(1 - \rho' F/\rho)],$$

where

$$F \equiv V(\cdot) + \lambda_1 I + \lambda_2 S_f + \lambda_3(L + A - D^c)$$

and a $^\circ$ over a variable denotes a derivative with respect to β. (The time variable has been eliminated through the transformation $dt = d\beta/\rho$.)

Across steady states where $I = S_f = \mathring{\lambda}_1 = \mathring{\lambda}_2 = 0$, (A9) and (A10) yield

$$\text{(A11)} \qquad \phi_K(1 - \tau) = \rho[V(E^c, D^c)]$$

and (A7), (A8), and (A11) imply

$$\text{(A12)} \qquad V_D(E^c, D^c) = V_E(E^c, D^c)[\phi_K(1 - \tau) - r_d],$$

where $E^c \equiv \phi(K)(1 - \tau) + r_d D^c - r_L L$. These are equations (11) and (12) in the text, which may be solved for K and D^c as a function of r_d, r_L, L, and τ.

Landowners

Landowners hold two stores of wealth, deposits, D^v, and bonds, B^v. Employing the same notation as in the previous section, their optimization problem may be stated as

$$\text{(A13)} \qquad \underset{\{D^v, E^v, S_f\}}{\text{Max}} \int_0^\infty [V(E^v, D^v)\exp - \int_0^t \rho(u_s)ds]dt$$

subject to

(A14) $$E^v = v(1 - \tau) + r_d D^v + r_b(A - D^v) - S_f$$

(A15) $$\dot{A} = S_f,$$

where now $A \equiv D^v + B^v$.

The solution to (A13) yields the conditions that in a steady state

(A16) $$\rho[V(E^v, D^v)] = r_b$$

(A17) $$V_D(E^v, D^v) = V_E(E^v, D^v)(r_b - r_d),$$

where $E^v = v(1 - \tau) + r_b B^v + r_d D^v$. From (A16) and (A17), we obtain the steady-state solutions for B^v and D^v:

(A18) $$B^v = f^2[r_b, r_d, v(1 - \tau)]$$

(A19) $$D^v = h^v(r_b, r_d),$$

where

$$f_1^2 = \{\rho' V_E r_b(V_E - J_o B^v) - (1 - \rho' V_E B^v)$$
$$[V_{DD} - V_{ED}(r_b - r_d) + r_d J_o]\}/\Delta \gtrless 0$$

$$f_2^2 = \rho' V_E[V_{DD} D^v - (V_{ED} + J_o)$$
$$(r_b - r_d)D^v - V_E r_b]/\Delta < 0$$

$$f_3^2 = -1/r_b < 0$$

$$h_1^v = r_b(J_o - \rho' V_E^2)/\Delta \gtrless 0$$

$$h_2^v = \rho' V_E^2 r_b/\Delta > 0$$

$$J_o \equiv V_{DE} - V_{EE}(r_b - r_d) > 0$$

$$\Delta \equiv \rho' V_E r_b[(V_{ED} + J_o)(r_b - r_d) - V_{DD}] > 0.$$

From the expressions for the f_i and h_i, some useful restrictions on the relative magnitudes of own- and cross-price effects can be derived. Note that

$$h_2^v + h_1^v > 0.$$

Furthermore

$$f_1^2 + h_1^v = -\Delta^{-1}(1 - \eta q)[V_{DD} - (V_{ED} + J_o)(r_b - r_d)] > 0,$$
$$f_1^2 + f_2^2 = -\Delta^{-1}(1 - \eta y)[V_{DD} - (V_{ED} + J_o)(r_b - r_d)] - r_b J_o < 0,$$

and

$$(f_1^2 h_2^v - f_2^2 h_1^v)\ sign\ of\,(1 - \eta y),$$

where $\eta \equiv \hat{\rho}/\hat{E}$, the elasticity of ρ with respect to real consumption expenditure (a circumflex denotes the percentage change in a variable); $q \equiv r_b B^v/E^v$, the share of real interest income from bonds in total real income; and $y \equiv r_b A/E^v$, the share of real asset "income" in total income (when the dollar value of its nonpecuniary benefits is included, the real return on deposits equals r_b). The above results follow under the restriction that ρ is strictly concave in C (implying $\eta < 1$) and the weak, realistic assumption that income from land rents is large enough that $y, q < 1$.

The normal result that $f_1^2 > 0$ requires

(A20) $$\rho' V_E^2 r_b - (1 - \eta q)[V_{DD} - V_{ED}(r_b - r_d)] - J_o[\eta(1 + r_b)q - 1] > 0.$$

The first two terms are positive as is the third under the very weak restriction that $\eta q < (1 + r_b)^{-1}$.

Workers

Workers hold both types of money, deposits, D^w, and currency, C, but do not purchase bonds. They solve the optimization problem:

(A21) $$\underset{\{S_f,\, E^w,\, D^w\}}{\text{Max}} \int_0^\infty [V(E^w, D^w, C)\exp - \int_0^t \rho(u_s)ds]dt$$

subject to

(A22) $$E^w = Y^w(1 - \tau) + r_d D^w - \pi(A - D^w) - S_f$$

(A23) $$\dot{A} = S_f,$$

where $A \equiv D^w + C$; Y^w denotes total wage income; and π is the inflation rate. The indirect utility function $V(\cdot)$ exhibits the following characteristics:

$$V_E, V_D, V_C, V_{ED}, V_{EC} > 0;\ V_{CD}, V_{EE}, V_{CC}, V_{DD} < 0;$$
$$V_{CC} - V_{DC} < 0;\ V_{DD} - V_{CD} < 0.$$

The negative sign for V_{CD} reflects the notion that the two assets are substitutes as mediums of exchange.

Optimizing behavior requires that in a stationary equilibrium the marginal rate of substitution between deposits and goods equals the time preference rate less the deposit rate:

$$\text{(A24)} \qquad \frac{V_D(E^w, D^w, C)}{V_E(E^w, D^w, C)} = \rho[V(E^w, D^w, C)] - r_d$$

and that the marginal nonpecuniary benefits of currency exceed those of deposits by an amount equalling the nominal deposit rate (the opportunity cost of currency):

$$\text{(A25)} \qquad \zeta(D^w, C) = V_E(E^w, D^w, C)(r_d + \pi),$$

where

$$E^w = Y^w(1 - \tau) + r_d D^w - \pi C$$

$$\zeta(D^w, C) = V_C - V_D.$$

The omission of E^w from $\zeta(\cdot)$ reflects the simplifying assumption that $V_{CE} = V_{DE}$ (changes in real consumption expenditure do not affect the relative marginal nonpecuniary benefits of deposits and currency). From the properties of the utility function, it is seen that $\zeta_D > 0$ and $\zeta_C < 0$.

The representative worker's asset demands are not as well defined as those of family firms and landowners because ρ is not pinned down by the rate of return on some asset (r_b for landowners and $\phi_K[1 - \tau]$ for capitalists). To ensure sensible asset demands, I assume

$$\text{(A26)} \qquad b_0 \equiv V_{EE}(\rho - r_d) - V_{DE} + V_E^2\rho' < 0$$

$$\text{(A27)} \qquad r_d b_0 < V_{DD} - V_{ED}(\rho - r_d) - V_E V_D \rho'$$

$$\text{(A28)} \qquad \gamma < E^w/(r_d + \pi)D^w,$$

where $\gamma \equiv -V_{EE}E^w/V_E$, the "partial" Arrow-Pratt measure of risk aversion (i.e., γ is defined for given values of D^w and C). The effect of an increase in Y^w on the incentive to accumulate deposits is given by the sign of $-b_0$. I assume the time preference rate does not increase too strongly (ρ' is relatively small) so that a higher Y^w tends to raise D^w. The second restriction guarantees that the marginal benefits of holding deposits decline relative to the opportunity cost of deposits as D^w increases. This requires that the positive income effect associated with greater deposit holdings, $r_d b_0$, not be too large. And finally, the condition stated in (A28) requires that γ not exceed the reciprocal of the share of nominal interest income in workers' total real income (which equals E^w in a steady state). Since the latter is a very large number, this restriction will be satisfied for realistic values of γ.

Given the restrictions in (A26)–(A28), it is easy to establish that the asset demands

$$D^w = h^w[Y^w(1 - \tau), r_d, \pi] \tag{A29}$$

$$C = g[Y^w(1 - \tau), r_d, \pi] \tag{A30}$$

have the properties

$$h_2^w, g_1 > 0, \quad g_3 < 0, \quad h_3^w, g_2 \gtrless 0.$$

The sign of h_1^w is positive or negative depending on whether

$$b_0\zeta_C - V_{EE}(r_d + \pi)[V_{DC} - V_{EC}(\rho - r_d) - V_E V_C \rho'] \gtrless 0. \tag{A31}$$

Casual observation and numerous empirical studies suggest that deposits are a normal, not an inferior, asset. Accordingly, I assume that the first positive term dominates the second negative term in (A31).

8 Debt Management and Negotiations

The Mexican debt began to grow rapidly in 1973 and is marked by three distinct phases. Table 8.1 presents a partial decomposition of the increase in the debt. What is striking in the decomposition is the fact that the net resource transfer accompanying the debt buildup has never been large. The resource transfer was greatest during the Echeverría administration, but due to large-scale capital flight in 1975 and 1976, the cumulative noninterest current account deficit totalled less than half of the increase in the debt. In the subsequent Lopez Portillo administration, the net resource transfer was negligible. Almost all new borrowing served to finance capital flight or interest payments on previously contracted debt; the cumulative noninterest current account deficit accounted for only 5 percent of the debt accumulated between 1977 and 1982. After 1982 the direction of resource flows was reversed and Mexico made large net transfers abroad. The De La Madrid administration ran the huge trade balance surpluses required to make interest payments on the debt. Unsettlingly, however, the current account registered a cumulative surplus of $9.6 billion from 1983 to 1986, even as the total debt